# MODIS Land Products Available in Giovanni to Support Asia Monsoon Regional Study


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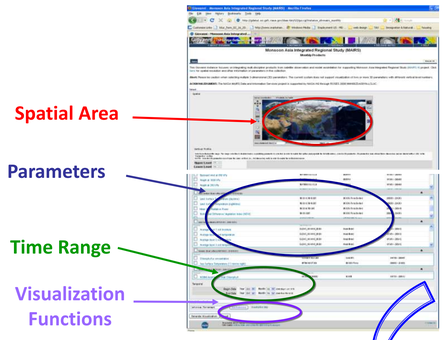
## Abstract


Monsoon Asia Integrated Regional Study (MAIRS) is an international program that attempts to understand the interactions between environment changes due to natural variation and human activities and the Asia monsoon climate, in particular that associated with the land cover changes. The application studies, especially with the GIS, require higher resolution products as the land cover changes happen in the local to regional scale. The MODIS land products of 250m to 1km resolution make such study possible. However, the higher resolution MODIS data files are distributed in tiles due to large data volumes. To conduct the time series study, it requires one to download all tiles that pass the study area for the entire study time period and mosaic tiles. This is a time consuming work. In supporting MAIRS program, NASA GES DISC (Goddard Earth Sciences Data and Information Services Center) has processed MODIS land products for the Asia monsoon region and integrated the data into the Giovanni system (Goddard Interactive Online Visualization ANd aNalysis Infrastructure) that enables users to explore, analyze, and download data or images easily. Available MODIS land products include vegetation index, land surface temperature, land cover type, active fire, etc. This presentation shows sample images of land products available in Giovanni and demonstrate analyses of seasonal and interannnual changes of vegetation index within a local area due to land cover changes by using Giovanni.


## Giovanni System

http://disc.gsfc.nasa.gov/giovanni




**Characters:**

- Customizable portals
- No need to install software; No need to download and process data
- Provide visualization and basic statistical analysis functions
- Able to download images and data in different formats

## Visualization Features:

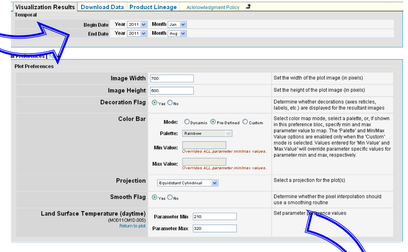
**Single Parameter Exploration:**

- Lat–Lon area plots of time-averaged parameters
- Time-series plots of area-averaged parameters
- Latitude/Longitude–Time Hovmöller diagram
- Animations of consecutive Lat–Lon area plots

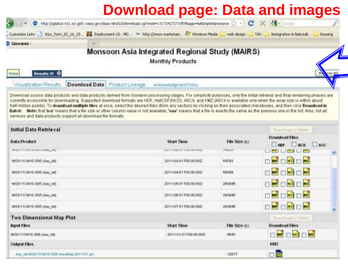
**Multi-parameter Intercomparison:**

- Lat–Lon area plots of overlain time-averaged parameters
- Time-series plots of multiple parameters
- Time-series of two-parameter differences
- Lat–Lon area plot of two-parameter differences
- Scatter plots with regression statistics
- Temporal correlation maps

Part of Result page: Options to refine images



Download page: Data and images

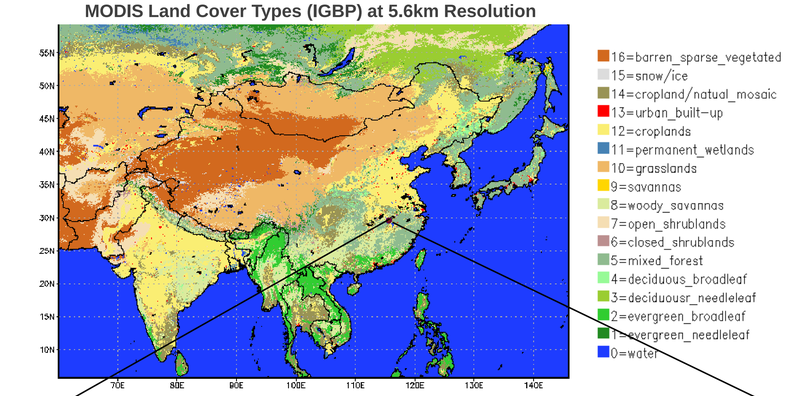



## Other Features:

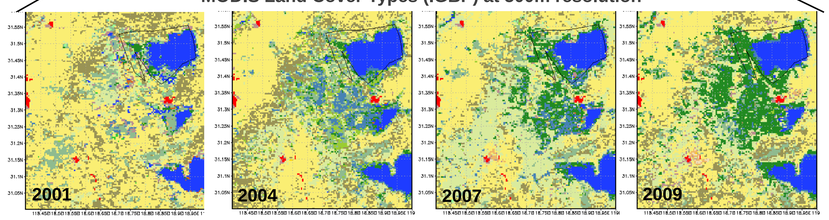
- Able to refine images in a number ways: color palette, min/max, map projection, image size, etc.
- Provides WMS: allows other web server to generate maps by using Giovanni as a back engine
- Current Input data formats: HDF-4, HDF-5, HDF-EOS, netCDF, and binary
- Able to fetch input data from local and different remote systems

## Detecting Local Vegetation Index Trend and Seasonal Cycle Changes Associated with Land Cover Change

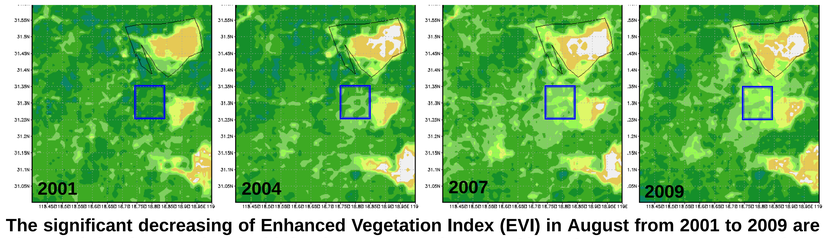
MODIS Land Cover Types (IGBP) at 5.6km Resolution



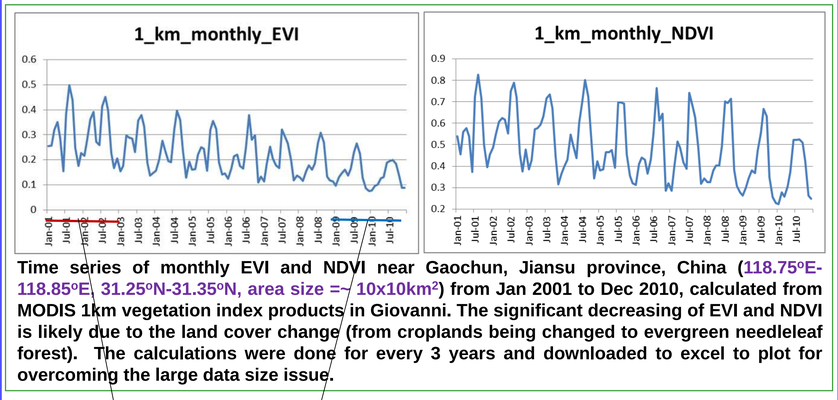

MODIS Land Cover Types (IGBP) at 500m resolution




MODIS Enhanced Vegetation Index at 1km resolution, August

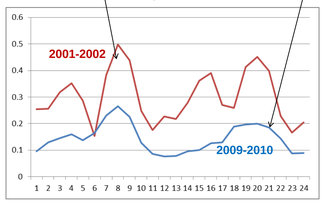



**The significant decreasing of Enhanced Vegetation Index (EVI) in August from 2001 to 2009 are observed that is associated with land cover type changes. Above Images were generated from 5.6km and 500m yearly land cover types, and 1km monthly EVI data in Giovanni.**



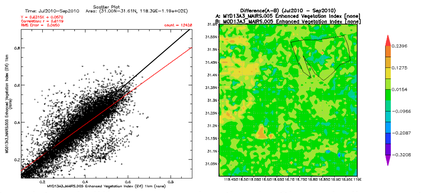

**Time series of monthly EVI and NDVI near Gaochun, Jiansu province, China (118.75°E-118.85°E, 31.25°N-31.35°N, area size =~ 10x10km²) from Jan 2001 to Dec 2010, calculated from MODIS 1km vegetation index products in Giovanni. The significant decreasing of EVI and NDVI is likely due to the land cover change (from croplands being changed to evergreen needleleaf forest). The calculations were done for every 3 years and downloaded to excel to plot for overcoming the large data size issue.**

Seasonal Cycle of EVI



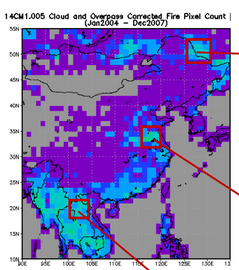

**Observed different seasonal cycles of EVI (and NDVI, not shown) over the same area between 2001-2002 and 2009-2010.**

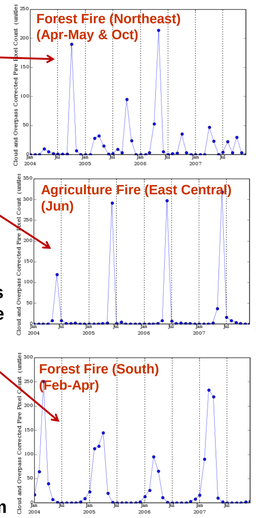
Compare EVI from Aqua and Terra



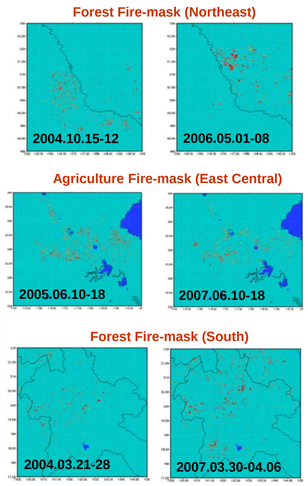
**Scatter plot and difference map function in Giovanni allow one to compare the same parameter from different instruments. Above figures show that EVI data from MODIS-Aqua are slightly higher than that from Terra for Jul-Sep 2009.**

## Studying Forest and Agriculture Fires



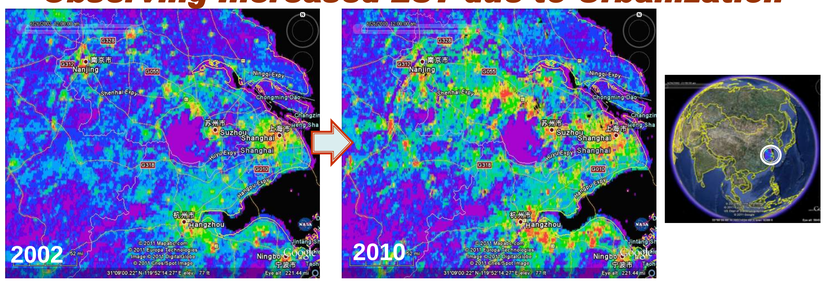




8-day 1km active fire-mask




***Above:*** **image shows four years (2004-2007) averaged active fire pixel count over east Asia.**
***Middle:*** **The time series of monthly fire pixel count show clearly different annual cycles over forest in northeast and south regions, and croplands over east central region.**
***Right:*** **The dates and locations of fire-mask can be viewed from the 8-day 1km data.**

## Observing Increased LST due to Urbanization




**Averaged MODIS-Aqua 1km resolution daytime Land Surface Temperature (LST) of July-August for 2002 and 2010 over Yangtze River Delta region, eastern China, indicating significant warming in the rapid urbanization zone. Images were generated with Giovanni and displayed in Google Earth. Available LST products in Giovanni were processed from MOD11A2.005 and MYD11A2.005, covering MAIRS region (0° – 60°N, 60°E – 150°E).**

## Land Products in Giovanni MAIRS

http://disc.sci.gsfc.nasa.gov/mairs/visualization

| Parameter Name | Product Name | Available Since | Time Interval | Spatial Resolution |
|---|---|---|---|---|
| Vegetation Indices | MODVI.005<br>MYDVI.005<br>MOD13A3_MAIRS.005<br>MYD13A3_MAIRS.005 | 2000.03 | Monthly | 1.0°<br>1 km, |
| Land Surface Temperature | MOD11CM1.005<br>MYD11CM1.005<br>MOD11A2_MAIRS.005<br>MYD11A2_MAIRS.005 | 2001.03 | Monthly<br>8-Day | 1.0°<br>1 km |
| Thermal anomalies/Fire | MOD14CM1.005<br>MYD14CM1.005<br>MOD14A2_MAIRS.005<br>MYD14A2_MAIRS.005 | 2000.03 | Monthly<br>8-Day | 1.0°<br>1 km |
| Land Cover Types | MCD12C1.005<br>MCD12Q1_MAIRS.005 | 2001 | Yearly | 5.6 km<br>500m |
| Land Cover Dynamics | MCD12Q2_MAIRS.005 | 2001 | Yearly | 500m |
| Leaf Area Index | MCD15A2_MAIRS.005<br>MCD15A3_MAIRS.005 | 2002.07 | 8-Day<br>4-Day | 1km |
| Total Evapotranspiration, Snow Water Equivalent | GLDAS | 1979.01 | Monthly | 1.0° |
| Surface Runoff, Soil Moisture | GLDAS | 1979.01 | Monthly | 1.0° |

**Operation** **In test** **Proposed**


***Acknowledgments:***

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